PARACHONETES, A NEW LOWER AND MIDDLE DEVONIAN BRACHIOPOD GENUS

by J. G. JOHNSON

ABSTRACT. *Parachonetes* is proposed as a new chonetid genus with *Chonetes macrostriata* Walcott from Nevada as its type species. It is thought to have been derived from the protochonetid genus *Eccentricosta*. Barrande's species *Chonetes verneuili* is assigned to *Parachonetes* as are two named species from south-eastern Australia. *Parachonetes* is absent in eastern North America, but is represented in Nevada, the Canadian Arctic, Novaya Zemlya, the Ural Mountains, Central Asia, south-eastern Asia, Czechoslovakia, and in south-eastern Australia.

IN the course of studies elucidating the Lower Devonian brachiopods of central Nevada (Johnson, in prep.) Walcott's species '*Chonetes*' *macrostriata* was studied through the preparation of internal moulds and found to be unassignable to any chonetid genus previously described. Further work on some excellent material of Barrande's species '*Chonetes*' *verneuili* from the Schary Collection at the Museum of Comparative Zoology, Harvard, showed that that species is congeneric. At the time these studies were in progress Talent (1963) published descriptions and illustrations of chonetids from the Lower Devonian of Victoria, Australia, which proved also to belong to the new genus. In addition silicified chonetids sent by Dr. Talent from the *Receptaculites* Limestone of New South Wales are illustrated herein and show the cardinalia very well.

SYSTEMATIC PALAEONTOLOGY

Superfamily CHONETACEA Bronn 1862
[*nom. transl.* Shrock and Twenhofel 1953 (*ex* Chonetidae Bronn 1862)]
Family CHONETIDAE Bronn 1862
Subfamily DEVONOCHONETINAE Muir-Wood 1962

Discussion. The two principal Silurian chonetid genera, *Protochonetes* and *Strophochonetes*, are much alike internally as a recent investigation of the interior of *Strophochonetes* has shown (Johnson, in prep.) and it seems likely that they shared a common ancestor. *Strophochonetes*, however, was assigned to a separate subfamily by Muir-Wood (1962, p. 40). *Parachonetes* gen. nov. is here assigned to the Devonochonetinae because of its close relation to *Eccentricosta* which must have been derived from *Protochonetes*, all of which suggest that a more critical appraisal needs to be made into the phylogenetic relations of *Protochonetes* and *Devonochonetes*. If the latter genus was indeed derived from the former, *Parachonetes* is a member of the Devonochonetinae although antipodal to the type genus *Devonochonetes*.

Genus PARACHONETES gen. nov.

Type species. Chonetes macrostriata Walcott 1884, p. 126.

Diagnosis. Protochonetids with low rounded costae originating along the hinge-line of some specimens. Brachial valve cardinalia characterized by a pair of posteriorly conjunct

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cardinal process lobes that develop an externally quadrilobate myophore and a more or less deep alveolus. Dorsal median septum present except on small specimens.

Discussion. Parachonetes is erected to include a group of chonetid species that were widespread geographically during most of Early Devonian and early Middle Devonian time. Medium and larger size shells are among the largest Lower Devonian chonetids and are deeply concavo-convex. In addition to the type species which is presently known only from Nevada, the genus includes *Chonetes verneuili* Barrande, which is widely reported in the Bohemian-Uralian faunal province in Czechoslovakia (Barrande 1879), Central Asia (Nikiforova 1937), the Ural Mountains (Rzhonsnitskaya 1960, p. 128), and as far north as Novaya Zemlya (Tscherkessowa 1960, p. 178). Topotype material of '*Chonetes*' *verneuili* was studied by the writer who was able to prepare internal moulds of both valves to confirm the generic assignment. These specimens are illustrated in figs. 4–8 on Plate 63. *Parachonetes verneuili* is a large species with much more regular ribbing than *P. macrostriatus* and in the brachial valve the alveolus of *P. verneuili* is shallower and broader. The writer has seen fragmentary remains of chonetids like *P. verneuili* from the upper Lower Devonian Stuart Bay Formation on Bathurst Island in the Canadian Arctic.

Chonetes kwangsiensis Wang (1956, p. 385, pl. 1, figs. D1–4) and *Strophomena carnica* Gortani (1915, p. 122, pl. 1, fig. 3) are species that resemble *Parachonetes* externally; however, their internal structures are unknown. The species *Plectambonites yenlacensis* Mansuy (1916, p. 49, pl. 7) probably is a *Parachonetes*. It has the typical shape and ribbing, a pair of lateral septa and a median septum in the brachial valve, and the posterior impression of the cardinal process is multilobate (Mansuy 1916, pl. 7, fig. 3*b*). Patte (1926, p. 62) suggested that several of the Indochinese chonetoids given different names by Mansuy, including *P. yenlacensis*, are no more than junior synonyms of *Chonetes zeili* Mansuy (1908, p. 36). It seems highly probable that this is true, but the figured specimens of Mansuy (1908, pl. 7, fig. 13) are insufficient for firm assignment to *Parachonetes*.

In addition to the North American and Eurasian occurrences of *Parachonetes*, the genus is represented by *Chonetes baragwanathi* Gill and by *Chonetes? suavis* Talent, both of which have recently been described and illustrated by Talent (1963) from the Lower Devonian of Victoria, Australia. *P. suavis* may prove to be synonymous with *P. baragwanathi* since the principal distinction of the former is its split dorsal septum, a feature that is evanescent in *P. macrostriatus*. There remains some uncertainty regarding generic affinities of *Chonetes? foedus* Talent (1963, pl. 37, 38).

Étienne Patte (1926, pp. 62, 63) first called attention to the resemblance between *P. verneuili*, *P. macrostriatus*, and several strongly concavo-convex coarse-ribbed species of Mansuy from Indochina. His astute evaluation, based wholly on considerations of external morphology, are borne out by the present investigation of the interior structures. Patte suggested further (1926, p. 63) that the Indochinese species '*C.*' *zeili* may be only a variety of *P. macrostriatus*.

Parachonetes macrostriatus and *P. verneuili* appear not to be threatened by senior synonyms, nor is there any basis to merge them together, and they may be usefully employed to split *Parachonetes* into two species groups, (1) the *macrostriatus* group with low, irregular, and commonly bifurcating costae and (2) the *verneuili* group, with even,

more elevated costae that rarely bifurcate. On this basis group 1 comprises species from Nevada, south-east Asia, and Australia while group 2 is restricted to Bohemia, the Carnic Alps?, Central Asia, the Ural Mountains, Novaya Zemlya, and the Canadian Arctic.

Comparison. *Eccentricosta* is smaller and less strongly concavo-convex than *Parachonetes* and on this basis *Eccentricosta* and small *Parachonetes* are indistinguishable. Internally the cardinal process lobes of *Eccentricosta* are relatively smaller and more blade-like than the stout curved lobes of *Parachonetes* and the latter bears a well-defined alveolus. In addition, the elaborate posterior quadrilobation of the cardinal process of *Parachonetes* is not developed in *Eccentricosta* (Berdan 1963, text-fig. 1c; Bowen, in press, pl. 2, fig. 9) nor is there a dorsal median septum in *Eccentricosta* although this is a well-developed structure in *Parachonetes*.

Parachonetes macrostriatus (Walcott)

Plate 62, figs. 1–17; Plate 63, figs. 1–3

1884 *Chonetes macrostriata* Walcott, p. 126, pl. 2, fig. 13 (?); pl. 13, figs. 14, 14*a*, 14*b*, 14*c*.
1940 *Chonetes macrostriata* Merriam, p. 55, pl. 6, fig. 4.
1944 *Chonetes macrostriatus* Cooper, p. 345, pl. 134, fig. 16.
1962 *Longispina macrostriatus* Muir-Wood, p. 47.

Discussion. Muir-Wood (1962, p. 47) incorrectly assigned this species to *Longispina*, but she evidently had not seen interiors of either valve since they do not show any marked resemblance to the interiors of *Longispina* (cf. Muir-Wood 1962, p. 46, figs. 7 A, B).

Description. Exterior. The shells are transversely shield-shaped with the cardinal angles approximately equal to right angles in small shells. Large shells are commonly auriculate. The valves are concavo-convex in lateral profile, becoming strongly concavo-convex in large specimens. The hinge-line is long and straight and is the place of maximum width. Very small spine bases are commonly developed along the hinge-line, but spines are seldom seen. On one small shell measuring 8 mm. along the hinge-line there are six short tubular spines on either side diverging laterally from the hinge-line at varying angles from approximately 30 to 50 degrees. The spines are hollow and are filled with matrix like that of the enclosing rock. The ventral beak is small, inconspicuous, and strongly incurved. The interarea of the pedicle valve is orthocline to anacline, commonly orthocline laterally, but anacline near the middle. The interarea of the brachial valve is hypercline. The delthyrium is triangular and very broad at its base enclosing an angle of greater than 100 degrees; however, the teeth fill a large portion of the lateral part of the delthyrium at the hinge-line leaving an opening that is semicircular rather than triangular.

The ornament consists of irregular low radial costae emanating from the beak, and on large specimens also along the lateral portions of the hinge-line. Costae commonly and irregularly increase in number by bifurcation and there may be 5 to about 8 costae in a space of 5 mm., 10 mm. anterior to the beak.

Interior of pedicle valve. The hinge teeth are small and triangular in cross section and attach directly to the interior of the shell at the inner edges of the delthyrium. There is a low median septum developed slightly anterior to the apex of the beak and it may continue anteriorly, dividing the vascular trunks. The median septum may be slightly

thickened or swollen at its posterior end. The diductor muscle scars are broad and flabellate, lightly impressed, and they blend with the interior of the shell imperceptibly along their anterior margin. The adductor scars are elongate and well defined. They are commonly fairly well impressed posteriorly and blend with the interior of the shell anteriorly. Laterally they may be deeply impressed or may be bounded by short, slightly arcuate, muscle bounding ridges. The vascular trunks are variably impressed anterior to the adductor scars. The internal surface of the valves is commonly pustulose due to the internal projection of the pseudopunctae and it is variably crenulated by the impress of the costae.

Interior of brachial valve. Broadly divergent sockets are widely set apart along the posterior edge of the shell and are bounded medially by low rounded socket plates. The socket plates join with a pair of posteriorly conjunct plates that form the cardinal process. The area between the cardinal process lobes is not only enclosed, but is depressed below the level of the surrounding shell material to form an approximately circular, broad, deep alveolus. On small shells the two cardinal process lobes are still partially separated medially at their posterior ends, but in larger specimens shell material is deposited around the plates, forming a more or less complete U-shaped structure, on the

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EXPLANATION OF PLATE 62

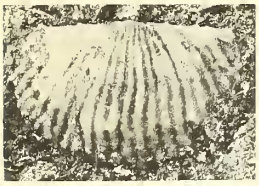
Figs. 1–17. *Parachonetes macrostriatus* (Walcott). '*Spirifer*' *pinyonensis* zone (Emsian), central Nevada. 1, Ventral view of the lectotype (×2), USNM 13809, Lone Mountain. Illustrated by Walcott (1884, pl. 13, fig. 14*b*). 2, Ventral view of a paratype (former cotype) (×1), USNM 13809A, Lone Mountain. Illustrated by Walcott (1884, pl. 13, fig. 14). 3, Ventral view (×3), USNM 140435, locality 10769, northern Roberts Mts. 4, Ventral view (×2), USNM 140436, locality 10709, Sulphur Spring Range. 5, Dorsal view of internal mould (×2), USNM 140437, locality 10762, northern Simpson Park Mts. 6, 7, Posterior view of middle part of hinge line (×5) and dorsal view (×1), USNM 140438, Lone Mountain. 8, Ventral view (×1), USNM 140439, locality 10788, Roberts Creek Mtn. 9, Rubber impression of internal mould of a small brachial valve (×5), impression of USNM 140440, locality 10729, McColley Canyon, Sulphur Spring Range. 10, 11, Internal mould of brachial valve and rubber impression (×3), USNM 140441, locality 10729, McColley Canyon, Sulphur Spring Range. 12, 13, Internal mould of brachial valve and rubber impression (×2), USNM 140442, locality 10729, McColley Canyon, Sulphur Spring Range. 14, Posterior view of internal mould of pedicle valve (×2), USNM 140443, locality 10705, northern Roberts Mts. 15, Internal mould of pedicle valve (×2), USNM 140444, locality 10729, McColley Canyon, Sulphur Spring Range. 16, 17, Posterior and ventral views of internal mould of pedicle valve (×1·5), USNM 140445, locality 10729, McColley Canyon, Sulphur Spring Range.

EXPLANATION OF PLATE 63

Figs. 1–3. *Parachonetes macrostriatus* (Walcott). Posterior, ventral, and anterior views of pedicle valve (×1), USNM 140446, locality 10705, '*Spirifer*' *pinyonensis* zone (Emsian), northern Roberts Mountains, central Nevada.

Figs. 4–8. *Parachonetes verneuili* (Barrande). Upper Koneprusy Limestone (lower Emsian), Czechoslovakia. 4, Posterior view of internal mould of pedicle valve (×2), USNM 140447. 5, 6, Posterior view (×2) and ventral view (×1) of internal mold of pedicle valve, Schary Collection, Museum Comparative Zoology, Harvard, 9441. 7, 8. Dorsal views (×1·5 and ×3) of internal mould, Schary Collection, Museum Comparative Zoology, Harvard, 9440.

Figs. 9–14. *Parachonetes* cf. *P. macrostriatus* (Walcott). *Receptaculites* Limestone, Taemas, N.S.W., Australia. 9, Dorsal view (×2), Geol. Surv. Victoria 61055. 10, Interior of brachial valve (×6), Geol. Surv. Victoria 61056. 11, Interior of pedicle valve (×3), Geol. Surv. Victoria 61054. 12, 13, Interior and posterior views of brachial valve (×6), Geol. Surv. Victoria 61058. 14, Interior of brachial valve (×3), Geol. Surv. Victoria 61057.



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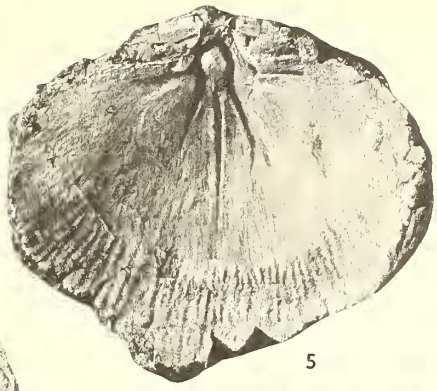

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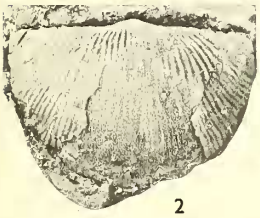

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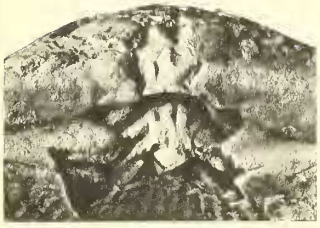

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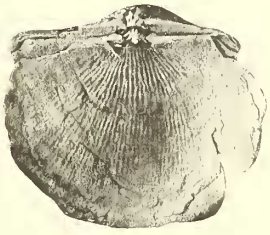

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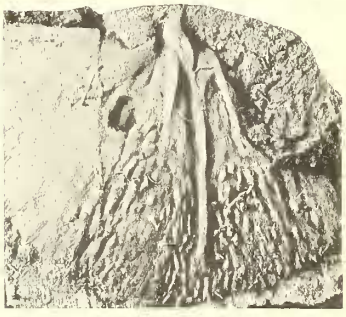

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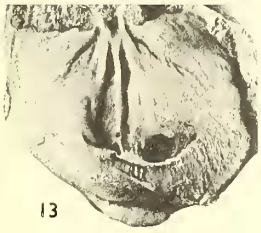

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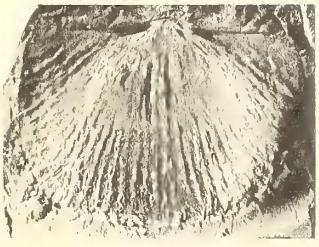

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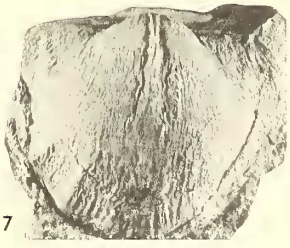

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JOHNSON, Devonian *Parachonetes* gen. nov.